2.1 Status Quo Alternative (No Action Alternative)

The status quo alternative, or no action alternative, is to maintain the 20 fm boundary line as the eastern boundary of the non-trawl Rockfish Conservation Area (RCA) for the commercial fixed gear fleet, both limited entry and open access, and as the boundary for the recreational fishery south of 40°10' N. lat. during July through December. This management measure was also analyzed in the 2003 Specs EIS. Although this alternative does not meet the purpose and need, it is evaluated as a comparison of impacts as required by NEPA.

2.2 30 fm Boundary Line from 36° N. lat. to US/Mexico Border Alternative (36° to Mexico Alternative)

The 30 fm Boundary Line Alternative, between 36° N. lat. and the US/Mexico Border, would move the boundary line from 20 fm to 30 fm during September through December. This line change would affect both the commercial fixed gear and recreational sectors.

2.3 30 fm Boundary Line from 36° N. lat. to 34°27' N. lat. Alternative (36° to 34°27' Alternative)

The 30 fm Boundary Line Alternative, from 36° N. lat. to 34°27' N. lat., would move the boundary line from 20 fm to 30 fm during September through December. The area from 36° N. lat. to 34°27' N. lat. is commonly referred to as the Morro Bay area. This line change would affect both the commercial fixed gear and recreational sectors.

2.4 30 fm Boundary Line from 34°27' N. lat. to US/Mexico Border Alternative (34°27' to Mexico Alternative– Preferred Alternative)

The 30 fm Boundary Line Alternative, between 34°27' N. lat. and the US/Mexico Border, would move the boundary line from 20 fm to 30 fm during September through December. The area from 34°27' N. lat.to the US/Mexico border is commonly referred to as the Southern California Bight area. This line change would affect both the commercial fixed gear and recreational sectors.

2.5 Issues considered but eliminated from further analysis

Different dates for implementing the possible line changes were discussed. In particular, the alternatives for the proposed action, except for status quo, were all discussed with effective dates of July through December. Guidance from the Council on Environmental Quality (CEQ) states that alternatives must be feasible and make common sense as noted in CEQ's 40 most asked questions #2. During review of the data for southern California, moving the line effective July through December rather than September through December is predicted to result in the OY for canary rockfish being exceeded. Unlike bocaccio, there is no new information on canary rockfish showing increased biomass and productivity, therefore potentially exceeding the OY in 2003 is not a feasible alternative and does not meet the purpose and need for this action. This option for each of the alternatives was eliminated from further analysis.

3 AFFECTED ENVIRONMENT

This chapter describes the environment, in resources, that would be affected either directly or indirectly by the alternatives. The extent of the discussion for each resource is relative to the predicted impact to that resource. Thus, resources expected to only be minimally impacted are discussed briefly. While the federally managed Pacific coast groundfish fishery occurs in waters off Washington, Oregon and California from 3 to 200 nm (within the US EEZ), the proposed alternatives in this EA all occur off Southern California. Therefore, the affected environment chapter will be focused in Southern California, south of 36° N. lat., recognizing that some environmental processes and species that range outside of the southern California may also be indirectly affected by ecological shifts in the southern California area.

3.1 Biological Environment

3.1.1 Overfished Groundfish Stocks

Harvest levels for overfished groundfish species must comport with rebuilding constraints specified in the Magnuson-Stevens Act, Groundfish FMP, and other legal mandates. Among these mandates are consideration of rebuilding strategies that have at least a 50% probability of rebuilding (achieving a spawning abundance of $B_{40\%}$ in West Coast groundfish management) within the maximum allowable time (T_{MAX}). The National Standard Guidelines (50 CFR Part 600) specify that rebuilding should occur within the lower limit of the time period required for rebuilding if fishing-related mortality were eliminated entirely. The National Standard Guidelines use 10 years as a cut off date for different rebuilding scenarios. For most of the overfished groundfish species, which are long-lived species, the lower limit of rebuilding is over 10 years. If the lower limit is estimated to take longer than 10 years at zero fishing mortality, then the maximum allowable rebuilding time specified in the National Standard Guidelines is the minimum possible rebuilding time (T_{MIN} = rebuilding at zero fishing mortality) plus one mean generation time. One mean generation time is the average length of time it takes for a spawning female to replace herself in the population and is an index of relative productivity. All of these rebuilding specifications are determined in rebuilding analyses generated from peer reviewed stock assessments. The standards, procedures, methodological approaches, and other terms of reference for conducting stock assessments and rebuilding analyses are formally reviewed, endorsed, and recommended by the Council's SSC. These documents, once formally endorsed by the Scientific and Statistical Committee (SSC) and adopted by the Council, are considered the best available science for rebuilding overfished groundfish species and prescribing harvest levels and management measures for the West Coast groundfish fishery.

Based on the Groundfish FMP’s standards for defining overfished groundfish species, nine West Coast groundfish species have been declared overfished by NMFS. These nine species are bocaccio, canary rockfish, cowcod, darkblotched rockfish, lingcod, Pacific ocean perch, Pacific whiting, widow rockfish, and yelloweye rockfish. Rebuilding parameters estimated for these stocks are found in Tables 4 and 5.

3.1.1.1 Bocaccio

Distribution and Life History: Bocaccio (*Sebastes paucispinis*) are found in the Gulf of Alaska off Krozoff and Kodiak Islands, south as far as Sacramento Reef, Baja, California (Hart 1988; Miller and Lea 1972). In survey catches, Allen and Smith (1988) found bocaccio to be most common at 100 m to 150 m over the outer continental shelf. Casillas *et al.* (1998) determined the depth zone where the southern bocaccio stock is most prevalent is 54 fm to 82 fm. Sakuma and Ralston (1995) categorized bocaccio as both a nearshore and offshore species. Larvae and small juveniles are pelagic (Garrison and Miller 1982) and are commonly found in the upper 100 m of the water column, often far from shore (MBC 1987). Large juveniles and adults are semi-demersal and are most often found in shallow coastal waters over rocky bottoms associated with algae (Sakuma and Ralston 1995). Adults are commonly found in eelgrass beds, or congregated around floating kelp beds (Love *et al.* 1990; Sakuma and Ralston 1995). Young and adult bocaccio also occur around artificial structures, such as piers and oil platforms (MBC 1987.) Although juveniles and adults are usually found around vertical relief, adult aggregations also occur over firm sand-mud bottoms (MBC 1987). Bocaccio move into shallow waters during their first year of life (Hart 1988), then move into deeper water with increased size and age (Garrison and Miller 1982).

Bocaccio are ovoviviparous (Garrison and Miller 1982; Hart 1988). Love *et al.* (1990) reported the spawning season to be protracted and last almost year-round (>10 months). Parturition occurs during January to April off Washington, November to March off Northern and Central California, and October to March off Southern California (MBC 1987). Two or more broods may be born in a year in California (Love *et al.* 1990). The spawning season is not well known in northern waters. Males mature at three years to seven years with 50% mature in four years to five years. Females mature at three years to eight years with 50% mature in four years to six years (MBC 1987).

Larval bocaccio often eat diatoms, dinoflagellates, tintinnids, and cladocerans (Sumida and Moser 1984). Copepods and euphausiids of all life stages (adults, nauplii and egg masses) are common prey for juveniles (Sumida and Moser 1984). Adults eat small fishes associated with kelp beds, including other species of rockfishes, and occasionally small amounts of shellfish (Sumida and Moser 1984). Bocaccio are eaten by sharks, salmon, other rockfishes, lingcod, albacore, sea lions, porpoises, and whales (MBC 1987). Bocaccio directly compete with chilipepper and widow rockfish, yellowtail, and shortbelly rockfishes for both food and habitat resources (Reilly *et al.* 1992).

Stock Status and Management History: There are two separate West Coast bocaccio populations. The southern stock exists south of Cape Mendocino (40°30' N. lat.) and the northern stock north of 48° N latitude in northern Washington (off Cape Flattery). It is unclear whether the southern and northern stock separation implies stock structure. The disjoint distribution of the two populations and evidence of lack of genetic intermixing suggests stock structure, although MacCall (2002a), spoke to some recent evidence for limited genetic mixing between the two populations. Nonetheless, assessment scientists and managers have treated the two populations as independent stocks north and south of Cape Mendocino.

The northern stock has not been assessed. The southern stock has been assessed (Bence and Hightower 1990; Bence and Rogers 1992; MacCall *et al.* 1999; Ralston *et al.* 1996b) and has suffered poor recruitment during the warm water conditions that have prevailed off Southern California since the late 1980s. The 1996 assessment (Ralston *et al.* 1996b) indicated the stock was in severe decline and overfished. NMFS formally declared the stock overfished in March 1999 after the Groundfish FMP was amended to incorporate the tenets of the Sustainable Fisheries Act. MacCall *et al.* (1999) confirmed the overfished status of bocaccio and estimated spawning output of the southern stock to be 2.1% of its unfished biomass and 5.1% of the MSY level.

While previous assessments only used data from Central and Northern California, the 2002 assessment (MacCall 2002b) also includes data for Southern California. While relative abundance increased slightly from the last assessment (4.8% of unfished biomass), potential productivity appeared lower than previously thought, making for a more pessimistic outlook. The Council assumed a medium recruitment scenario for the 1999 year class, which was not assessed by MacCall *et al.* (1999). But the 2002 assessment revealed the 1999 year class experienced relatively lower recruitment. Therefore, the 1999 year class—though contributing a substantial quantity of fish to the population—did not contribute as much to rebuilding as was previously thought.

As discussed in more detail in Section 1.4 of this EA, the 2003 assessment of the southern stock of bocaccio shows improvement from the 2002 assessment, largely due to the strength of the 1999 year class (MacCall 2003). The 1999 year class had not recruited into the indices used in the 2002 assessment, but did show up as a strong year class in the indices used for the 2003 assessment. This had dramatic effects on the rebuilding projections due to improved estimates of current biomass and productivity of the stock. There are 3 separate models presented in the rebuilding analysis. Two were approved by the STAR panel: one of which omits a new recreational data source developed by Dr. Alec MacCall and the other rejects the results from recent NMFS trawl surveys. Dr. MacCall proposed a third approach that is a hybrid of the previous two models and utilizes all data sources, the STAT C model. All three models show an improvement in the stock status for bocaccio. Bocaccio is still overfished, but is improving at a faster rate than previously expected. The Council's Groundfish Scientific and Statistical

Committee (SSC) reviewed all three rebuilding analysis models at the June 2003 Council meeting. The SSC felt the STAT C model was a reasonable way to integrate the survey and CPUE data and, therefore, recommended use of the STAT C model for bocaccio.

3.1.1.2 Canary

Distribution and Life History: Canary rockfish (*Sebastes pinniger*) are found between Cape Colnett, Baja, California, and southeastern Alaska (Boehlert 1980; Boehlert and Kappenman 1980; Hart 1988; Love 1991; Miller and Lea 1972; Richardson and Laroche 1979). There is a major population concentration of canary rockfish off Oregon (Richardson and Laroche 1979). Canary rockfish primarily inhabit waters 91 m to 183 m (50 fm to 100 fm) deep (Boehlert and Kappenman 1980). In general, canary rockfish inhabit shallow water when they are young, and deep water as adults (Mason 1995). Adult canary rockfish are associated with pinnacles and sharp drop-offs (Love 1991) and are most abundant above hard bottoms (Boehlert and Kappenman 1980). Canary rockfish appear to be a reef-associated species in the southern part of its range (Boehlert 1980). In Central California, newly settled canary rockfish are first observed at the seaward sand-rock interface and farther seaward in deeper water (18 m to 24 m). Canary rockfish off the West Coast exhibit a protracted spawning period from September through March, probably peaking in December and January off Washington and Oregon (Hart 1988; Johnson *et al.* 1982). Female canary rockfish reach sexual maturity at roughly eight years of age. Like many members of *Sebastes*, canary rockfish are ovoviviparous, whereby eggs are internally fertilized within females, and hatched eggs are released as live young (Bond 1979; Golden and Demory 1984; Kendall and Lenarz 1986). Canary rockfish are a relatively fecund species, with egg production being correlated with size, (e.g., a 49 cm female can produce roughly 0.8 million eggs, and a female that has realized maximum length (approximately 60 cm) produces approximately 1.5 million eggs (Gunderson 1971). Very little is known about the early life history strategies of canary rockfish, but limited research indicates larvae which are strictly pelagic (near ocean surface) for a short period of time, begin to migrate to demersal waters during the summer of their first year of life and develop into juveniles around nearshore rocky reefs, where they may congregate for up to three years (Boehlert 1980; Sampson 1996). Evaluations of length distributions by depth developed from NMFS shelf trawl survey data generally supported other research that suggests this species is characterized by an increasing trend in mean size of fish with depth (Archibald *et al.* 1981; Boehlert 1980). Female canary rockfish generally grow faster and reach slightly larger sizes than males, but do not appear to live longer than males. Adult canary rockfish feed primarily on small fishes, as well as planktonic creatures, such as krill and euphausiids (Love 1991; Phillips 1964).

Stock Status and Management History: From 1983 through 1994, canary rockfish were managed as part of the *Sebastes* complex, with various trip limits imposed over this period. In 1995, limits specific to canary rockfish (cumulative monthly landing limit of 6,000 pounds) were imposed, and commercial vessels were expected to sort the canary rockfish from the mixed species categories such as the *Sebastes* complex. For 1998, catches of canary rockfish were regulated using a two-month cumulative landing limit of 40,000 pounds for the *Sebastes* complex, of which, no more than 15,000 pounds (38%) could be composed of canary rockfish. From 1998 to present, commercial groundfish fishing for canary rockfish has been drastically reduced, and the only significant take is that from incidental bycatch. Canary rockfish has become a limiting factor for other nongroundfish fisheries on the West Coast shelf.

The 1999 stock assessment documented the stock had declined below the overfished level ($B_{25\%}$) in the northern area (Columbia and U.S. Vancouver International North Pacific Fishery Commission (INPFC) areas Crone *et al.* 1999) and in the southern area (Conception, Monterey, and Eureka areas Williams *et al.* 1999) and was declared overfished in January. The first rebuilding analysis (Methot 2000a) used results from the northern area assessment to project rates of potential stock recovery. The stock was found to have extremely low productivity, defined as production of recruits in excess of the level necessary to maintain the stock at its current, low level. Rates of recovery were highly dependent upon the level of recent recruitment, which could not be estimated with high certainty. The initial rebuilding OY for 2001 and 2002 was set at 93 mt based upon a 50% probability of rebuilding by the year 2057, a medium level for these recent recruitments, and maintaining a constant annual catch of 93 mt through 2002 (see Table 4).

A new assessment was done coastwide in 2001 for canary rockfish, treating the stock as a single unit from the Monterey INPFC area north through the U.S. Vancouver INPFC area, and thus, departing from the methodologies of past assessments (Methot and Piner 2002b). Although there is some evidence of genetic separation of the northern and southern stocks (Boehlert and Kappenman 1980; Wishard *et al.* 1980), the observed variability in growth rate by sex and area was not significantly different at small versus large spatial scales. They also determined the areas of highest canary rockfish density were off headlands that separate INPFC areas, which would tend to bias results if the assessment was stratified by area. A critical uncertainty in canary rockfish assessments is the lack of older, mature females in surveys and other assessment indices. The are two competing explanations for this observation. Older females could have a higher natural mortality rate, resulting in their disproportionate disappearance from the population. Alternatively, survey and fishing gears may be less effective at catching them, because older females hide in places inaccessible to the gear, for example. If this is the case, then these fish (which, because of their higher spawning output may make an important contribution to future recruitment) are part of the population, but remain un-sampled. Methot and Piner (2002b) combined these two hypotheses in a single age-structured version of the SSC-endorsed stock synthesis assessment model (Methot 2000b) by allowing female natural mortality to increase with the maturity function, but also allowing selectivity to be domed (the model determines the selectivity of survey and fishery gear as opposed to assuming a fixed selectivity). They estimated the current abundance of canary rockfish coastwide is about 8% of B_0.

3.1.1.3 Lingcod

Distribution and Life History: Lingcod (*Ophiodon elongatus*), a top order predator of the family Hexagrammidae, ranges from Baja, California to Kodiak Island in the Gulf of Alaska. Lingcod are demersal at all life stages (Allen and Smith 1988; NOAA 1990; Shaw and Hassler 1989). Adult lingcod prefer two main habitat types: slopes of submerged banks 10 m to 70 m below the surface with seaweed, kelp, and eelgrass beds and channels with swift currents that flow around rocky reefs (Emmett *et al.* 1991; Giorgi and Congleton 1984; NOAA 1990; Shaw and Hassler 1989). Juveniles prefer sandy substrates in estuaries and shallow subtidal zones (Emmett *et al.* 1991; Forrester 1969; Hart 1988; NOAA 1990; Shaw and Hassler 1989). As the juveniles grow they move to deeper waters. Adult lingcod are considered a relatively sedentary species, but there are reports of migrations of greater than 100 km by sexually immature fish (Jagielo 1990; Mathews and LaRiviere 1987; Matthews 1992; Smith *et al.* 1990).

Mature females live in deeper water than males and move from deep water to shallow water in the winter to spawn (Forrester 1969; Hart 1988; Jagielo 1990; LaRiviere *et al.* 1980; Mathews and LaRiviere 1987; Matthews 1992; Smith *et al.* 1990). Mature males may live their whole lives associated with a single rock reef, possibly out of fidelity to a prime spawning or feeding area (Allen and Smith 1988; Shaw and Hassler 1989). Spawning generally occurs over rocky reefs in areas of swift current (Adams 1986; Adams and Hardwick 1992; Giorgi 1981; Giorgi and Congleton 1984; LaRiviere *et al.* 1980). After the females leave the spawning grounds, the males remain in nearshore areas to guard the nests until the eggs hatch. Hatching occurs in April off Washington, but as early as January and as late as June at the geographic extremes of the lingcod range. Males begin maturing at about two years (50 cm), whereas females mature at three plus years (76 cm). In the northern extent of their range, fish mature at an older age and larger size (Emmett *et al.* 1991; Hart 1988; Mathews and LaRiviere 1987; Miller and Geibel 1973; Shaw and Hassler 1989). The maximum age for lingcod is about 20 years (Adams and Hardwick 1992).

Lingcod are a visual predator, feeding primarily by day. Larvae are zooplanktivores (NOAA 1990). Small demersal juveniles prey upon copepods, shrimps, and other small crustaceans. Larger juveniles shift to clupeids and other small fishes (Emmett *et al.* 1991, NOAA 1990). Adults feed primarily on demersal fishes (including smaller lingcod), squids, octopi, and crabs (Hart 1988, Miller and Geibel 1973, Shaw and Hassler 1989). Lingcod eggs are eaten by gastropods, crabs, echinoderms, spiny dogfish, and cabezon. Juveniles and adults are eaten by marine mammals, sharks, and larger lingcod (Miller and Geibel 1973, NOAA 1990).

Stock Status and Management History: In 1997, U.S. scientists assessed the size and condition of the portion of the stock in the Columbia and Vancouver areas (including the Canadian portion of the Vancouver management area), and concluded the stock had fallen to below 10% of its unfished size (Jagielo *et al.* 1997). The Council responded by imposing substantial harvest reductions coastwide, reducing the harvest targets for the Eureka, Monterey, and Conception areas by the same percentage as in the north. In 1999, scientists assessed the southern portion of the stock and concluded the condition of the southern stock was similar to the northern stock, thus confirming the Council had taken appropriate action to reduce harvest coastwide (Adams *et al.* 1999).

Jagielo *et al.* (2000) conducted a coastwide lingcod assessment and determined the total biomass increased from 6,500 mt in the mid-1990s to about 8,900 mt in 2000. In the south, the population has also increased slightly from 5,600 mt in 1998 to 6,200 mt in 2000. In addition, the assessment concluded previous aging methods portrayed an older population; whereas new aging efforts showed the stock to be younger and more productive. Therefore, the ABC and OY were increased in 2001 on the basis of the new assessment. A revised rebuilding analysis of coastwide lingcod (Jagielo and Hastie 2001) was adopted by the Council in September 2001. It confirmed the major conclusions of the 2000 assessment and rebuilding analysis, but slightly modified recruitment projections to stay on the rebuilding trajectory that reaches target biomass in 2009. This modification resulted in a slight decrease in the 2002 ABC and OY.

3.1.1.4 Cowcod

Distribution and Life History: Cowcod *(Sebastes levis)* occur from Ranger Bank and Guadalupe Island, Baja, California to Usal, Mendocino County, California (Miller and Lea 1972). Cowcod range from 21 m to 366 m in depth (Miller and Lea 1972) and are considered to be parademersal (transitional between a midwater pelagic and benthic species). Adults are commonly found at depths of 180 m to 235 m and juveniles are most often found in 30 m to 149 m of water (Love *et al.* 1990). MacGregor (1986) found that larval cowcod are almost exclusively found in Southern California and may occur many miles offshore. Adult cowcod are primarily found over high relief rocky areas (Allen 1982). They are generally solitary, but occasionally aggregate (Love *et al.* 1990). Solitary subadult cowcod have been found in association with large white sea anemones on outfall pipes in Santa Monica Bay (Allen 1982). Juveniles occur over sandy bottom areas and solitary ones have been observed resting within a few centimeters of soft-bottom areas where gravel or other low relief was found (Allen 1982). Although cowcod are generally not migratory; they may move, to some extent, to follow food (Love *et al.* 1991). Cowcod are ovoviviparous, and large females may produce up to three broods per season (Love *et al.* 1990). Spawning peaks in January in the Southern California Bight (MacGregor 1986). Cowcod grow to 94 cm (Allen 1982). Larvae are extruded at about 5.0 mm (MacGregor 1986). Juveniles eat shrimp and crabs, and adults eat fish, octopus, and squid (Allen 1982).

Stock Status and Management History: The cowcod stock south of Cape Mendocino has experienced a long-term decline. Abundance indices decreased approximately ten-fold between the 1960s and the 1990s based on commercial passenger fishing vessel (CPFV) logs (Butler *et al.* 1999). Recreational and commercial catch also declined substantially from peaks in the 1970s and 1980s, respectively. The cowcod stock in the Conception INPFC area (Point Conception to the U.S./Mexico border) was assessed for the first time in 1998 (Butler *et al.* 1999). Unfished spawning biomass (B_0) was estimated to be 3,370 mt, and 1998 spawning biomass was estimated at 7% of B_0, well below the 25% overfishing threshold. As a result, NMFS declared cowcod in the Conception and Monterey management areas overfished in January 2000. The stock's low productivity and declined spawning biomass necessitates an extended rebuilding period, estimated at 62 years with no fishing-related mortality (T_{MIN}) , to achieve a 1,350 mt B_{MSY} for the Conception management area (see Table 4).

3.1.1.5 Yelloweye Rockfish

Distribution and Life History: Yelloweye rockfish *(Sebastes ruberrimus*) range from the Aleutian Islands, Alaska to northern Baja, California and are common from Central California northward to the Gulf of Alaska (Eschmeyer *et al.* 1983; Hart 1988; Love *et al.* 1991; Miller and Lea 1972; O'Connell and Funk 1986). Yelloweye rockfish occur in water 25 m to 550 m deep with 95% of survey catches occurring from 50 m to 400 m (Allen and Smith 1988). Yelloweye rockfish are bottom dwelling, generally solitary, rocky reef fish, found either on or just over reefs (Eschmeyer *et al.* 1983; Love *et al.* 1991; O'Connell and Funk 1986). Boulder areas in deep water (>180 m) are the most densely populated habitat type, and juveniles prefer shallow-zone broken-rock habitat (O'Connell and Carlile 1993). They also reportedly occur around steep cliffs and offshore pinnacles (Rosenthal *et al.* 1982). The presence of refuge spaces is an important factor affecting their occurrence (O'Connell and Carlile 1993).

Yelloweye rockfish are ovoviviparous and give birth to live young in June off Washington (Hart 1988). The age of first maturity is estimated at six years and all are estimated to be mature by eight years (Wyllie Echeverria 1987). Yelloweye rockfish can grow to 91 cm (Eschmeyer *et al.* 1983; Hart 1988). Males and females probably grow at the same rates (Love *et al.* 1991, O'Connell and Funk 1986). The growth rate of yelloweye rockfish levels off at approximately 30 years of age (O'Connell and Funk 1986). Yelloweye rockfish can live to be 114 years old (Love *et al.* 1991, O'Connell and Funk 1986). Yelloweye rockfish are a large predatory reef fish that usually feeds close to the bottom (Rosenthal *et al.* 1988). They have a widely varied diet, including fish, crabs, shrimps and snails, rockfish, cods, sand lances, and herring (Love *et al.* 1991). Yelloweye rockfish have been observed underwater capturing smaller rockfish with rapid bursts of speed and agility. Off Oregon the major food items of the yelloweye rockfish include cancroid crabs, cottids, righteye flounders, adult rockfishes, and pandalid shrimps (Steiner 1978). Quillback and yelloweye rockfish have many trophic features in common (Rosenthal *et al.* 1988).

Stock Status and Management History: The first ever yelloweye rockfish stock assessment was conducted in 2001 (Wallace 2002). This assessment incorporated two area assessments: one from Northern California using catch per unit of effort (CPUE) indices constructed from Marine Recreational Fisheries Statistical Survey (MRFSS) sample data and California Department of Fish and Game (CDFG) data collected on board commercial passenger fishing vessels, and the other from Oregon using Oregon Department of Fish and Wildlife (ODFW) sampling data. The assessment concluded current yelloweye rockfish stock biomass is about 7% of unexploited biomass in Northern California and 13% of unexploited biomass in Oregon. The assessment revealed a thirty-year declining biomass trend in both areas with the last above average recruitment occurring in the late 1980s. The assessment's conclusion that yelloweye rockfish biomass was well below the 25% of unexploited biomass threshold for overfished stocks led to this stock being separated from the rockfish complexes in which it was previously listed. Until 2002, when yelloweye rockfish were declared overfished, they were listed in the "remaining rockfish" complex on the shelf in the Vancouver, Columbia, and Eureka INPFC areas and the "other rockfish" complex on the shelf in the Monterey and Conception areas. As with the other overfished stocks, yelloweye rockfish harvest is now tracked separately.

In June 2002 the SSC recommended that managers should carry out a new assessment incorporating Washington catch and age data. This recommendation was based on evidence the biomass distribution of yelloweye rockfish on the West Coast was centered in waters off Washington and that workable data from Washington were available. The Council received that testimony and recommended completing a new assessment in the summer of 2002, before a final decision was made on 2003 management measures. Methot *et al.* (2002) did the assessment, which was reviewed by a STAR Panel in August. The assessment result was much more optimistic than the one prepared by Wallace (2002), largely due to the incorporation of Washington fishery data. While the overfished status of the stock was confirmed (24% of unfished biomass), Methot *et al.* (2002) provided evidence of higher stock productivity than originally assumed. The assessment also treated the stock as a coastwide assemblage. A revised rebuilding analysis was prepared following completion of the 2002 assessment. Due to the less depleted stock status and higher productivity estimated by the updated assessment, the rebuilding period is shorter than had been estimated following the initial rebuilding analysis. The SSC indicated that the revised rebuilding analysis represented the best available science and advised using it to set 2003 harvest levels. The 22 mt OY for yelloweye rockfish adopted in 2003 is based on a 50% probability of yelloweye rockfish rebuilding by 2052.

3.1.1.6 Widow Rockfish

Distribution and Life History: Widow rockfish (*Sebastes entomelas*) range from Albatross Bank of Kodiak Island to Todos Santos Bay, Baja, California (Eschmeyer *et al.* 1983; Miller and Lea 1972; NOAA 1990). Widow rockfish occur over hard bottoms along the continental shelf (NOAA 1990). Widow rockfish prefer rocky banks, seamounts, ridges near canyons, headlands, and muddy bottoms near rocks. Large widow rockfish concentrations occur off headlands such as Cape Blanco, Cape Mendocino, Point Reyes, and Point Sur. Adults form dense, irregular, midwater and semi-demersal schools deeper than 100 m at night and disperse during the day (Eschmeyer *et al.* 1983, NOAA 1990, Wilkins 1986). All life stages are pelagic, but older juveniles and adults are often associated with the bottom (NOAA 1990). All life stages are fairly common from Washington to California (NOAA 1990). Pelagic larvae and juveniles co-occur with yellowtail rockfish, chilipepper, shortbelly rockfish, and bocaccio larvae and juveniles off Central California (Reilly *et al.* 1992).

Widow rockfish are viviparous, have internal fertilization, and brood their eggs until released as larvae (NOAA 1990; Ralston *et al.* 1996a; Reilly *et al.* 1992). Mating occurs from late fall-early winter. Larval release occurs from December through February off California, and from February through March off Oregon. Juveniles are 21 mm to 31 mm at metamorphosis, and they grow to 25 cm to 26 cm over three years. Age and size at sexual maturity varies by region and sex, generally increasing northward and at older ages and larger sizes for females. Some mature in three years (25 cm to 26 cm), 50% are mature by four years to five years (25 cm to 35 cm), and most are mature in eight years (39 cm to 40 cm) (NOAA 1990). The maximum age of widow rockfish is 28 years, but rarely over 20 years for females and 15 years for males (NOAA 1990). The largest size is 53 cm and about 2.1 kg (Eschmeyer *et al.* 1983, NOAA 1990).

Widow rockfish are carnivorous. Adults feed on small pelagic crustaceans, midwater fishes (such as age-one or younger Pacific whiting), salps, caridean shrimp, and small squids (Adams 1987; NOAA 1990). During spring, the most important prey item is salps, during the fall fish are more important, and during the winter widow rockfish primarily eat sergestid shrimp (Adams 1987). Feeding is most intense in the spring after spawning (NOAA 1990). Pelagic juveniles are opportunistic feeders, and their prey consists of various life stages of calanoid copepods, and euphausiids (Reilly *et al.* 1992).

Stock Status and Management History: The most recent assessment of the widow rockfish stock occurred in 2000 (Williams *et al.* 2000). The spawning output level (8,223 mt), based on that assessment and a revised rebuilding analysis (Punt and MacCall 2002) adopted by the Council in June 2001, was at 24.6% of the unfished level (33,490 mt) in 1999, which was computed using the average recruitment from 1968 to 1979 multiplied by the spawning output-per-recruit at zero fishing mortality. The analysis concluded the rebuilding period in the absence of fishing is 22 years, and with a mean generation time of

16 years, the maximum allowable time to rebuild (T_{MAX}) is 38 years.

The 2003 widow rockfish ABC (3,871 mt) was based on estimated biomass and an $F_{50\%}$ harvest rate. The 2003 OY for widow rockfish was 832 mt, which conforms with a 60% probability of rebuilding by 2039.

3.1.2 Other Groundfish Species

For the commercial non-trawl gear fleet (limited entry fixed gear and open access non-trawl) south of 40°10' N. lat., other groundfish species that are both targeted or caught incidentally include minor slope rockfish, splitnose rockfish, sablefish, thornyheads, flatfish, whiting, minor shelf rockfish and minor nearshore rockfish. In the recreational fishery south of 40°10' N. lat., targeted species include rockfish (except for bocaccio cowcod, canary rockfish and yelloweye rockfish), kelp greenling, rock greenling, cabezon, California scorpionfish, lingcod and sanddabs. Table 2 in the final rule for the 2003 specifications and management measures (68 FR 11182; March 7, 2003) lists species in the minor rockfish categories south of 40°10' N. lat. For a detailed description of these other groundfish species, refer to Sections 3.2.1.2 and 3.2.1.3 of the 2003 Specs EIS, which provides distribution, life history, stock status and management information on these species.

3.1.3 Nongroundfish Fish Species

For information on nongroundfish species harvested with fixed gear that may incidentally harvest groundfish in southern California, such as California halibut and salmon, see Section 3.2.2 of the 2003 Specs EIS, which provides distribution, stock status and management information on these species.

3.1.4 Protected Species

Certain species are protected from certain activities, such as harvest, by any of the following four mandates: the Endangered Species Act of 1973 (ESA), the Marine Mammal Protection Act of 1972 (MMPA), the Migratory Bird Treaty Act (MBTA) and EO 13186. Protected species in southern California, such as sea turtles, marine mammals and seabirds, are part of the affected environment. For a description of protected species, see Section 3.2.3 of the 2003 Specs EIS, which provides distribution, stock status and management information on these species.

3.2 Habitat

The 1996 Sustainable Fisheries Act re-authorizing and amending the Magnuson-Stevens Act obligates the Councils and NMFS to identify and characterize essential fish habitat (EFH), which for West Coast groundfish is defined as the aquatic habitat necessary to allow for groundfish production to support long-term sustainable fisheries for groundfish and for groundfish contributions to a healthy ecosystem. To satisfy this description EFH must be described for all life history stages of managed species. EFH descriptions have been incorporated into the Groundfish FMP in both section 11.10 and in a detailed appendix (available online at: http://www.nwr.noaa.gov/1sustfsh/efhappendix/page1.html). West Coast groundfish species managed by the Groundfish FMP occur throughout the EEZ and occupy diverse habitats at all stages in their life histories. EFH for a particular species may be large, because a species' pelagic eggs and larvae are widely dispersed for example, or comparatively small as is the case with the adults of many nearshore rockfishes which show strong affinities to a particular location or type of substrate. For a detailed description of habitat, see Section 3.1.2 in the 2003 Specs EIS.

3.3 Socioeconomic Environment

The alternatives discussed in this EA all affect the commercial fixed gear (limited entry and open access) and recreational sectors in southern California. In recent years, these fisheries have been severely constrained both in area open to fishing, trip limits and, for the recreational fishery, in seasons open to fishing. Beginning in 2003, the limited entry fixed gear fleet in California has been severely constrained by low trip limits and limited nearshore fishing opportunities, with the non-trawl RCA (the area closed to most fishing with non-trawl gear) extended from the 20 fm (37 m) depth contour to latitude and longitude coordinates approximating the 150 fm (274 m) depth contour. These management measures were designed to limit the incidental take of overfished groundfish species, namely bocaccio. The recreational fishing fleet in California has been similarly constrained in 2003, by a reduced season length (July - December) and limited nearshore fishing opportunities, generally shoreward of the 20 fm (37 m) depth contour, to minimize the incidental take of bocaccio. Since 2000, the recreational fishery has been subject to fishery closures for part of the year. Between 2000 and 2002, the California recreational fishery seasons have extended for between 8 and 10 months. Beginning in 2001, area restrictions were implemented with only restricted recreational fishing in the Cowcod Conservation Areas and fishing restricted to inside the 20 fm (37 m) depth contour for part of the year. In 2003, the recreational fishery has been restricted to a 6 month season entirely inside of the 20 fm (37 m) depth contour. These restrictions on the non-trawl commercial and recreational fishing sectors in southern California set the stage for the socioeconomic environment.

Of the roughly 450 vessels with Pacific Coast groundfish limited entry permits, approximately 46% are fixed gear (longline or trap/pot gear) (2003 Specs EIS). Unlike the limited entry sector, the open access fishery has unrestricted participation and is comprised of vessels targeting or incidentally catching groundfish with a variety of gears, excluding groundfish trawl gear. While the open access groundfish fishery is under federal management and does not have participation restrictions, some state and federally-managed fisheries that land groundfish in the open access fishery have implemented their own limited entry (restricted access) fisheries or enacted management provisions that have affected participation in groundfish fisheries.

The 2003 Specs EIS describes the socioeconomic environment in detail (Section 3.3). As provided by CEQ NEPA implementing regulations at 40 CFR 1502.21, the detailed socioeconomic baseline environment is hereby incorporated by reference. In further compliance with the CEQ regulations at 1502.21, this EA summarizes some of the relevant information from that document. Based on the 2000 through 2001 base period in PacFIN, the 178 vessels in the limited entry fixed gear fleet are concentrated in the northern ports of Bellingham, Port Angeles, Newport, Port Orford, Westport, Astoria, and Moss Landing. This group is dominated by the sablefish fleet operating primarily on the shelf and slope. Open access vessels deriving at least 5% of revenue from groundfish is the largest groundfish category in the table. These 771 vessels are distributed throughout the coast. In the North, these vessels are more engaged in shelf and slope fisheries. The southern fleet is more engaged nearshore. The second most numerous groundfish category is composed of the open access vessels deriving less than 5% of revenue from groundfish. Major concentrations of these 517 vessels operate from Newport, Charleston, Santa Barbara, and Garibaldi. The southern fleet is more active nearshore. Altogether there were 1,710 vessels recorded as landing significant quantities of groundfish of the total 4,589 vessels operating in all fisheries coastwide. For recreational fisheries in the U.S., over 9 million anglers took part in 76 million marine recreational fishing trips in 2000. The Pacific coast accounted for about 22% of these participants and 12% of trips. Seventy percent of West Coast trips were made off California. Table 6 shows the numbers of marine anglers by West Coast state in 2000. The table shows that California's marine recreational fishery dominates the other West Coast states both in terms of numbers of anglers and trips. Table 7, at the end of this document, shows the relative importance of groundfish in West Coast states' recreational fisheries between 1996 and 2001. Although only a relatively minor share of West Coast recreational effort overall, in three of the four regions, groundfish catch, either targeted or incidental, accompanied a significant share of both charter and private recreational trips. Only in Southern California did groundfish appear to be a relatively minor part of regional marine recreational effort.

3.4 Bycatch of overfished species among sectors

Two major classes of fishing gear are used in the limited entry fixed gear sector: traps and longlines. These gears have different rates of observed bycatch of the overfished species. Baited longlines, whether deployed horizontally on the bottom or deployed vertically in the water column, are much more effective at capturing rockfish, and therefore, more prone to incidentally catch overfished rockfish species than traps. Limited entry fixed gear fisheries have primarily targeted rockfish and sablefish on the shelf and slope. Groundfish landings for this sector are depicted in Tables 8 and 9. With no corresponding bycatch model for this fishery, discard in the fishery is not as well known nor understood as in the limited entry trawl fishery. The proportion of shelf rockfish species landed with fixed gear has increased in recent years. This has been especially true since the small footrope restrictions were imposed on the trawl fishery in 2000. Some shelf rockfish species, such as canary rockfish and yelloweye rockfish, have been a highly valued target for this sector of the fishery.

Directed open access fisheries that target groundfish use the same fixed gear types and fish in the same areas as the limited entry fixed gear sector. Rockfish are targeted species for this sector as well. The landings of overfished groundfish species in open access non-shrimp fisheries (Table 9) include landed catch from open access fisheries targeting groundfish and landings of incidentally-caught groundfish in incidental (non-shrimp) open access fisheries. The distribution of groundfish catch and bycatch in incidental open access fisheries is far less certain than in the other sectors (Table 10). In some cases, groundfish landings may have been an important supplement to the income generated while pursuing nongroundfish targets, while, in other cases, groundfish bycatch was truly incidental.

Most bocaccio harvest occurred in Southern California in recent years, although in 2000, Northern California had a slightly higher harvest than Southern California (Table 11). Canary rockfish are harvested primarily in Northern California and Oregon, with minor amounts in Southern California and Washington. Cowcod are encountered almost exclusively in Southern California. Widow rockfish are caught primarily in Northern California, and occasionally in Oregon but rarely in Southern California and Washington. Yelloweye rockfish are caught throughout Washington, Oregon, and Northern California, although most of the Northern California catch occurs north of Cape Mendocino. Yelloweye are caught rarely in Southern California. Lingcod is popular throughout the West Coast , but the majority of harvest occurs in Northern California and Oregon.

4 IMPACTS OF THE ALTERNATIVES

This chapter analyzes the impacts, or environmental consequences, of the alternatives. It is organized by resource with the impacts of each alternative appearing under the discussion of that resource. Table 15, below, provides a list of the alternatives and summarizes their impacts.